

NOTES ON BATRACHIA.

By

C. R. NARAYAN RAO, M.A.

(With a text block.)

The delay in publishing the following notes, dealing with a part of my collection of batrachians made in 1918, is due to the fact that Dr. Boulenger's manual, *Fauna of British India, Reptilia and Batrachia*, was found inadequate for the purpose of accurately determining the species. The publication of his recent memoir on the genus *Rana* has rendered the situation, at least a part of it, comparatively easy. In order to make the ground surer, my specimens were sent to the British Museum to be compared with the large series of collections at that institution, where they were kindly examined by Miss J. B. Procter to whom my grateful thanks are due. I quote freely from her letter regarding every specimen subjected to her examination and I have given full reasons for differing from her in cases where I have done so.

RANA GRACILIS MONTANUS var. nov. (sub-genus *Hylorana*.)

Vomerine teeth in short, oblique series between the choanae, farther from each other than from the latter.*

Head well depressed, longer than broad; the upper surface of the head slightly concave with a prominent U-shaped glandular fold; the two limbs of the fold run close to the upper eyelid, and diverge in front of the eye. The broad angle of the fold extends as far back as the end of the head.* Snout obtusely, projecting beyond the mouth: the length of the snout is distinctly greater than the diameter of the eye. Canthus rostralis distinct; loreal region vertical, slightly concave. Nostrils nearer the tip of the snout than the eye. The interorbital width is considerably broader than the upper eyelid;* the distance between the nostrils is shorter than the interorbital space.* Tympanum very distinct, $\frac{2}{3}$ to $\frac{5}{8}$ the diameter of the eye, separated from it by a space equal to a third or exceeding a third of its diameter.*

Anterior limb.—Fingers slender, swollen at the tips, first finger longer than the second; the third considerably longer than the snout or $1\frac{1}{2}$ to twice the diameter of the eye. Subarticular tubercles large and prominent.

Hind limb.—Long and slender, the tibio-tarsal articulation reaches far beyond the snout;* heels strongly overlap when the limbs are folded at right angles to the body. Tibia 4.5 to slightly 6 times as long as broad;* $1\frac{1}{2}$ to $1\frac{3}{4}$ times in the length from snout to vent;* shorter than the forelimb; much longer than the foot.* Toes long and slender; tips dilated into small discs, longer than broad with a horse shoe-shaped groove separating the upper surface from the lower. Half-webbed, three phalanges of the fourth, one of third and fifth toes free. Outer metatarsals separated by a web. Subarticular tubercles as big as those of fingers and prominent. No tarsal fold. Inner metatarsal tubercle blunt prominent, suboval $\frac{1}{2}$ to $\frac{1}{4}$ th the length of the inner toe. A rounded outer-metatarsal tubercle on the base of the fourth toe.

Skin smooth above. A moderate dorso-lateral fold from above the tympanum to the groin. The greatest distance between the dorso-lateral folds on the back is $\frac{1}{4}$ th the length of head and body.* A second or ventro-lateral fold is absent. A short fold, rather interrupted behind, from the end of the snout or beneath the eye to the shoulder. A few glandules simulating a fold on the shoulder.

Colour.—Olive-brown above: sides of head and body dark-brown. Dark spots frequently present on the back in younger specimens. The dorso-lateral glandular fold pale-brown or whitish, edged with a dark streak to the tip of the snout. Tympanum reddish. Upper lip white. Dark broad bands on both

limbs. Hinder sides of thighs marbled, and the ventral surface yellow. Throat mottled. In the young, the subocular fold is white and the foot black.

Bones.—Nasal bones very broad, separated in the middle. Behind, the nasals unite with the fronto-parietals. The suture between the frontals and the parietals noticeable. The ethmoids exposed; fronto-parietals and ethmoids form the U-shaped ridge which lies below the fold of skin on the head. The zygomatic branch of the squamosal equals its posterior branch. The diapophyses of the sacral vertebra are elevated dorsally. The omoosternal style is broadly forked. Metasternum very long.

Locality.—1 and 2 Hill forests of Bhagamandla and 3, 4 and 5 Hills, Somavarpet, Coorg, 4,000—4,500 feet. They were all taken near the water courses. My colleague Mr. A. Subba Rao recently obtained several specimens of this local race from the hills of Kadur, Mysore, 4,000 feet.

Miss Procter who examined only a single specimen says, "your specimen of *Rana gracilis* agrees well with ones from Ceylon in this collection." An expression of opinion like this lead me to scrutinise my examples more thoroughly and the conclusion I have arrived at is that they belong to a new local race of *gracilis*.

Points marked* in the above description are the characters in which all my five examples differ from the Ceylon specimens and in order to render the position still more clear I give below the measurements of Dr. Boulenger side by side with my own.

Nos. 1 (type) and 2 have been sent to the British Museum and 3 and 4 to the Indian Museum.

Measurements in mms.	RANA GRACILIS.					NEW VARIETY.				
	Dr. Boulenger's measurements of his five Specimens.					Central College Specimens.				
	1	2	3	4	5	1	2	3	4	5
Snout to vent	50	64	60	47	41	75.6	65.5	63	33	41
Length of head	18	22	19	16	15	26	24.5	25	13	15
Width of head	16	19	19	15	14	25	22.5	23	11	14
Snout	7	9	7	6	6	11	12.5	11	6	7
Internasal width .. ..	..	..	..	..	..	7	7	7	4	5
Interorbital width ..	4	5	4	4	3	8	7.5	8	3.5	5
Distance between nostril and eye .. ..	..	..	..	..	..	6	6	6	4	4.5
Diameter of eye	6	7	6	6	6	10	8.5	8.5	5	6
„ of tympanum	5	5	5	4	4	6	5.5	5	3	3.5

Measurements in mms.	RANA GRACILIS.					NEW VARIETY.				
	Dr. Boulenger's measurements of his five Specimens.					Central College Specimens.				
	1	2	3	4	5	1	2	3	4	5
Distance between eye and tympanum .. ..	..	..	..	..	..	2.5	2.5	2.5	1	2
Anterior limb	33	40	40	32	27	54	42	46	25	34
„ 1st finger	8	10	10	7	6	13	10.5	11	5	7
„ 2nd „	6.5	8	8	6	5	10	8	9	4	5
„ 3rd „	10	12	12	9	8	15	12	12	7	10
„ 4th „	6	7	8	6	5	9	8	8	4.5	6
Hind limb	90	105	109	91	73	143	121.5	126	57	85
Femur .. ..	..	..	..	..	..	34	30	30	14	22.5
Tibia	28	34	34	28	24	44	39	41	19	26
Tarso metatarsus .. ..	..	..	..	..	..	21	18.5	23	9	13
Foot	29	34	35	29	25	37	34	32	15	27
1st toe .. ..	..	..	..	..	..	13	7	8	5	5
2nd toe .. ..	..	..	..	..	..	18	13	14	7	8.5
3rd toe	15	18	19	15	13	27	18.5	21	9	14.5
4th toe	24	29	29	24	21	38	30	33	14	22
5th toe	16	22	21	16	14	28	20	21	10	15
Outer metatarsal tuber- cle .. ..	..	..	..	..	..	2	2	2	1	1
Inner metatarsal tuber- cle .. ..	..	..	..	..	..	3	2.5	3	1.5	2

RANA BHAGMANDLENSIS sp. nov. (sub-genus *Hylorana*.)

Vomerine teeth in oblique series from the anterior angle of choanæ, extending beyond the level of their posterior borders, being separated by a narrow median line only. The tongue is deeply indented and the coruna are fairly long.

Habit.—Body slender with a waist.

Head moderate, depressed, the length is to breadth as 6 is to 5: snout subacuminate, not projecting beyond the mouth. The snout is nearly as long as or only very slightly longer than the diameter of the eye. Canthus rostralis distinct, gently sloping towards the tip of the snout: loreal region vertical and concave. The interorbital width is equal to the internasal distance and is nearly twice the width of the upper eyelid: nostrils nearer to the tip of the snout. Tympanum very distinct half or slightly more than half the diameter of the eye. The distance between the eye and the tympanum is less than half the diameter of the latter.

Anterior limbs.—Fingers long and slender, the first equals the second: tips of fingers dilated into discs bearing a horse-shoe-shaped groove, separating the upper surface from the lower. Subarticular tubercles prominent. No tubercular swellings on the palm.

Hind limbs.—Long and slender; the tibiotarsal articulation reaches between the eye and nostril: the heels overlap when the limbs are folded at right angles to the body: tibia nearly four times as long as broad, more than half the length of the body (from snout to vent), and considerably shorter than the foot: tips of toes discoidal and half-webbed: no dermal borders on the first and last toes: the third toe is just as long as or only slightly shorter than the fifth. Two metatarsal tubercles, both papilla-like, the white outer is at the base of the fourth toe; the inner nearly twice as long as the outer and less than $\frac{1}{4}$ the length of the first toe. Subarticular tubercles well developed though small.

Skin.—Upper surface smooth, extremely fine pearly granulations. A frontal gland is present. The dorso-lateral glandular fold is moderate: ventral surface is smooth: no glandular fold from the eye to the shoulder. A few glandules simulating a fold on the shoulder and behind the angle of jaws.

Colour.—Upper surface bright orange in the adult spirit specimens and pink in the live condition: more greyish with mottlings in the younger forms. Sides of body and snout dark. Ventral surface yellow, becoming orange on the lower surface the thighs: abdomen faintly blotched. Both limbs barred. Foot black, the jaws are white, throwing the loreal region into strong relief.

Skull.—Nasal bones are broad and unite with one another and with the fronto-parietals; Omoosternal style forked at base and extending anteriorly nearly as far as the corpus linguæ: metasternum also long; epi and pre-coracoids almost disappear.

Locality.—Water courses in the forests of Bhagamandla, Coorg, 4,000 feet.

According to Dr. Boulenger's scheme this frog would be put in section D, *R. erythræa*.

Miss Procter who examined two specimens writes thus: "Possibly a new species. They agree well with the description of *R. aurantiaca* in Dr. Boulenger's monograph, but they are not the same. I have compared them with a specimen and find that though they have similar characters and colouration, *R. aurantiaca* is much more elongate in habit, length of head going $3\frac{1}{4}$ in total length as against $2\frac{1}{2}$."

No. 1 (type) presented to the British and No. 2 to the Indian Museum.

Measurements of *Rana bhagamandlensis* in mm.

				1	2	3
From tip of snout to vent	..	..	..	30	23.5	16
Length of the head	..	..	..	12	10	6.5

	1	2	3
Greatest width of the head	10	9	5
Snout	6	5	3
Internasal width	3	3	2
Interorbital width	3	3	2
Distance between the eye and nostril	4	3	2
Diameter of the eye	5	5	2
„ „ tympanum	3	2·5	1·5
Distance between the eye and tympanum ..	1	1	·5
Anterior limb (including the digit)	18	17	10
1st finger	4	2·5	2
2nd „	4	2·5	2
3rd „	6	5	3
4th „	4	3	2
Hind limb	57	40·5	22·5
Femur	11	10	6
Tibia	16	13	8
Tarso metatarsus	9	6·5	8·5
Foot	21	11	10·
1st toe	4	3	..
2nd „	6	3·5	..
3rd „	10	5	..
4th „	14	9	..
5th „	3	5	..
Breadth of tibia	4	3	..
Metatarsal tubercle	1	1	..

RANA LIMNOCHARIS MYSORENSIS var. nov. (sub-genus *Rana*).

Vomerine teeth in oblique series between the choanæ, beginning about the middle of these orifices, meeting in the median line and not extending beyond their posterior borders.

Habit.—Body slender with not a well-marked waist.

Head as long as broad, moderately depressed: snout pointed, slightly projecting beyond the mouth, longer than the diameter of the eye. Canthus rostralis obtuse: loreal region oblique and slightly concave. Nostrils nearer the tip of the snout. Internasal width equals the interorbital space which is much less than the upper eyelid. Tympanum distinct, $\frac{1}{2}$ to $\frac{3}{8}$ the diameter of the eye and nearly twice its distance from the latter.

Fore limbs.—Fingers blunt, long and slender; first longer than the second; third as long as or a little longer than the snout. Subarticular tubercles well developed and very prominent; the base of the second and third fingers usually swollen into round tubercular prominences.

Hind limb long, the tibio-tarsal articulation reaching nearly the tip of the snout: heels very broadly overlap when the limbs are folded at right angles to the body. Tibia about four times as long as broad; $1\frac{1}{2}$ to $1\frac{3}{4}$ in length from snout to vent: about $\frac{2}{3}$ the length of the foot. Toes slightly swollen at the tips, less than half-webbed, two segments of the fifth, three of the fourth and two of the others are free. Outer metatarsals nearly free. Subarticular tubercles shovel-shaped or discoidal and very prominent. Tarsal fold well developed in the distant half. Inner metatarsal tubercle about $\frac{1}{3}$ or less than $\frac{1}{2}$ the length of the inner toe. A fairly big rounded outer metatarsal tubercle not confluent with the dermal fold of the outer toe.

Skin.—Upper parts with longitudinal cutaneous folds from behind the head right up to the end of the body, with shorter broken folds between. Sides with warty tubercles, sometimes tipped with cornified minute spines. No fold across the head behind the eyes. A strong curved glandular fold from the eye to the shoulder. Abdomen corrugated. Throat and chest smooth. Thighs free from granules.

Colour.—Olive-brown or green above with a distinct narrow or broad yellow vertebral band: the upper surface is blotched; a V-shaped dark band between the eyes; dark bands radiate from the eyes and a white streak from the posterior border of the eye to the shoulder passing through the lower half of the tympanum. The abdomen is yellow. Throat and chest beautifully marbled or powdered black. Lips blotched or the lower lip with a series of white vertical bands separated by very dark areas, sometimes producing a festoon-like arrangement. Limbs barred. Hinder surface of thighs marbled.

Locality.—Water courses in the forests of Jog, Shimoga, Mysore State, 4,000—5,000 feet.

This local race is to be assigned to the group *Rana tigrina*.

Miss Procter who examined a specimen of this frog writes as follows; "It does not disagree in any particular with *R. limnocharis*. There is, however, certainly something about its *tout-en-semble* which differs from the majority of our specimens. Several specimens here have equally short webs and several have the broad vertebral band associated with longitudinal glandular folds, instead of the commoner warts. A male and a female from Sikkim have similar, but less strongly marked ventral corrugations. Possibly yours is a local race."

This local race of which I have several examples though unfortunately most are under 31mm. differs from *R. limnocharis* forma typica and its known varieties in having a smaller tympanum in relation to the diameter of the eye, in the proportions of the length and breadth of the tibia, and the ratio of the former to the total length of body and being shorter than the foot. The absence of any fold behind the head and non-granulate thighs add to the distinctive character.

No. 1 (type) and a few more examples presented to the British and No. 2 to the Indian Museums.

Measurements in mm. of *Rana limnocharis mysorensis*.

Those below 31mm. have not been measured, but have been examined otherwise.

	Sgn. type 2. mm.	Type No. 1, mm.
From tip of snout to vent	31	36·5
Length of the head	10	13
Width of the head	10·5	14
Snout	5	6·5
Internasal width	2·5	2
Interorbital width	2·5	2
Distance between the nostril and eye	3	3
Diameter of the eye	4·5	5
„ „ tympanum	2	3
Distance between tympanum and the eye	1·5	1·5
Anterior limb	21	24
1st finger	4·5	7·5
2nd „	3	6
3rd „	5	7
4th „	3·5	6
Hind limb.. .. .	57	79
Femur	13·5	18
Tibia	17	24·5
Tarso metatarsus	9·5	11·5
Foot	17	25
1st toe	3	7
2nd „	5	10
3rd „	9·5	16

broken in the middle. The teeth under high magnification appear like a tier of shoe-horn-shaped structures fringed with spike-like processes. The lower labial disk bears, in addition to finger-like tactile processes, rounded smaller papillae with a central mass of melanin pigment. Anus tubular, dextral. Tail nearly twice the length of body. Caudal membranes weakly developed in front, but strongly marked posteriorly. Greatest depth of tail $\frac{1}{2}$ in the length. Terminal part of tail pointed or bluntly rounded, both membranes equally deep. A frontal gland is usually present. Glandular swellings in front of and rarely below the eyes. Minute rows of muciferous glands over the loreal region, continued from behind the eye on the sides of the body where occasionally two such rows are met with.

Dorsal surface of the body rufous black, ventral grey. Tail marbled or blotched.

Measurements of a larva in which the hind limbs are fully grown.

Total length	..	..	..	33 mm.
Length of body	..	..	..	23 mm.
Length of tail	..	..	..	23 mm.
Depth of body	..	..	..	5 mm.
Width of body	..	..	..	6 mm.
Depth of tail	..	..	..	4 mm.

The tadpoles were collected from the hill streams at Hebbe and Muthode, (Kadur, Mysore) at an elevation 4,000 ft., by Mr. A. Subba Rao. Specimens have been presented to the British and Indian Museums.

With a view to examine the larval teeth of the tadpole of *N. pygmaeus* (Rec. Ind. Mus., 18, Vol. xv, p. 21, pl. 1, figs. 5, 5a), I requested the Director of the Zoological Survey of India to send me kindly a specimen, which, however bears teeth exactly like the figure given by Gadow (Camb. Nat. Hist. Amph. Rept. p. 58, 1909). I further understand that these tadpoles have been discovered to belong to *N. major* and not *N. pygmaeus*.
